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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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09/982,846 10/22/2001 Atsushi Koike 839,449 8378

5514 7590 04/21/2004

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EXAMINER

KIELIN, ERIK J

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 04/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|-------------------------------|------------------------------|--|
| Office Action Summary | Application No. 09/982,846 | Applicant(s) KOIKE ET AL. | |
| | Examiner Erik Kielin | Art Unit 2813 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) 5-8 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 22 December 2003 has been entered.

Claim Status

2. **Cancellation of generic claim 9 is acknowledged.**

Drawings

3. The drawings were received on 24 October 2004. These drawings are acceptable.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 3, and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 8-97161 (**Takai**).

Regarding claim 1, **Takai** discloses a film-forming method for forming a deposited film on a substrate **205, 305** arranged in a substantially enclosed film-forming vessel (Figs. 2, 3) by means of plasma CVD, said film-forming vessel being provided with a raw material gas introduction means **211, 302** and an exhaustion means **208, 308**, said film-forming method comprising the steps of

introducing a raw material gas comprising at least a hydrogen gas and a silicon-containing raw material gas into said film-forming vessel through said raw material gas introduction means (Tables 2, 4);

maintaining an inner pressure of said film-forming at a desired value by means of said exhaustion means (Tables 2, 4); and

introducing a high frequency power into said film-forming vessel through a discharge electrode **213, 313** provided in said film-forming vessel to generate a plasma in a plasma generation region **212, 312** between said substrate **205, 305** and said discharge electrode **213, 313** in said film-forming vessel, thereby forming said deposited film on said substrate maintained at a desired temperature using heater **207, 307**,

characterized in that the formation of said deposited film on said substrate is performed while repetitively applying a periodicity voltage having at least two different waveform components (20 to 450 MHz component and DC bias voltage component) having a different amplitude to an auxiliary electrode **202, 302** arranged at a position in said plasma generation region of said film-forming vessel. (See at least paragraph [0014].)

Regarding claim 2, it is seen to be inherent that the periodicity voltage has (i) a waveform component having an amplitude capable of generating mainly a radical of a silicon-containing

compound and (ii) a waveform component having an amplitude capable of forming mainly a radical of hydrogen. (See Table 2.) Because the source of both hydrogen and silicon can be silane (SiH_4), the periodicity voltage components (i) and (ii) can be the same component. There exists no requirement that the components (i) and (ii) be different. Accordingly, the component that dissociates silane produces mainly a radical of silicon and mainly a radical of hydrogen by breaking one Si-H bond of silane.

Regarding claim 3, **Takai** discloses the auxiliary electrode **202, 302** is arranged such that said auxiliary electrode **202, 302** is opposed to a film-forming surface of the substrate **205, 305** and is situated at a position between the substrate **205, 305** and the discharge electrode **213, 313**. (See Figs. 2 and 3.)

Regarding claim 4, **Takai** discloses the auxiliary electrode **208** is arranged to be in parallel to the substrate **205, 305** and perpendicular to a flowing direction of the raw material gas which flows from the raw material introduction means **211, 302** toward the exhaustion means **208, 308** in the film-forming vessel. (See Figs. 2 and 3.)

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Takai** in view of US 4,795,529 (**Kawasaki** et al.). The prior art of **Takai**, as explained above, discloses each of the claimed features.

In the event, it is believed that the DC component in **Takai** is not a "waveform" component, then this may be a difference.

However, **Kawasaki** teaches a plasma deposition characterized in that the formation of said deposited film on said substrate is performed while repetitively applying a periodicity voltage having at least two different waveform components having a different amplitude to an auxiliary electrode. (See Figs. 3, 8, 10, 12, and 17.) **Kawasaki** teaches that the two components give more control of the plasma and thereby improve the results of the plasma deposition (Abstract.)

It would have been obvious for one of ordinary skill in the art, at the time of the invention to apply the two waveform components of **Kawasaki** to the auxiliary electrode of **Takai** to give improved control of the plasma, in particular improved control of the acceleration of the ions toward the substrate. There exists a reasonable expectation of success since one of the two components applied to the electrodes in each of **Takai** in **Kawasaki** is for the same purpose of accelerating the ions toward the substrate.

Response to Arguments

8. Applicant's arguments with respect to claims 1-4 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 5,573,595 (**Dible**) and US 6,043,607 (**Roderick**) each teach plasma deposition characterized in that the formation of the deposited film on a substrate is performed while repetitively applying a periodicity voltage having at least two different waveform components having a different amplitude to an auxiliary electrode in the plasma generation region of said film-forming vessel.

US 4,539,068 (**Takagi** et al.) teaches a plasma deposition method using mixed frequencies of different amplitude to an auxiliary electrode to form a higher quality film. (Note that the **Takagi** et al. reference is the US equivalent of the prior art Japanese patent publication JP 56-45760 discussed in paragraph [0003] of the **Takai** publication.)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erik Kielin whose telephone number is 571-272-1693. The examiner can normally be reached on 9:00 - 19:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2813

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Erik Kielin
Primary Examiner
14 April 2004